AECOM

Standard Operating Procedure
Lower Passaic River Restoration Project

Surface Water Sampling for Trace Metals

Procedure Number: LPR-FI-06

Revision No.: 3

Revision Date: August 2011

Prepared by

Kristen Durocher
Aaron Hopkins

Debra L. Simmons
Laura Kelmar

Laura Kelmar, Project Manager — Date: August 10, 2011

Debra L. Simmons, Project QA Manager — Date: August 10, 2011

Annual review of this SOP has been performed and the SOP still reflects current practice.

Initials: _____ Date: _____
Initials: _____ Date: _____

Contents

1.0 Scope and applicability

1.1 This project Standard Operating Procedure (SOP) defines the procedures for the collection of surface water samples in the Lower Passaic River Study Area and the Newark Bay Study Area as part of the Lower Passaic River Restoration Project (LPRRP) using clean hands/dirty hands (CH/DH) protocols (USEPA, 1996). Sampling will be conducted from a boat or other sampling platform.

1.2 Samples will be collected for chemical analyses. Use of this SOP is restricted to metals, including but not limited to low-level mercury, methylmercury and hexavalent chromium. Analytes for a particular program are specified in the Quality Assurance Project Plan (QAPP).

1.3 It is assumed that the sampling activities described in this SOP will be conducted in conjunction with water column profiling (SOP LPR-FI-05) and/or surface water sampling for other parameters (SOP LPR-FI-04).

1.4 It is fully expected that the procedures outlined in this SOP will be followed. Procedural modifications may be warranted depending upon field conditions or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by the Project Quality Assurance (QA) Manager and the Task Manager and communicated to the Cooperating Parties Group (CPG) Project Coordinator and the United States Environmental Protection Agency (USEPA) Remedial Project Manager (RPM). Deviations from this SOP will be documented in the field records. The ultimate procedure employed will be documented in the report summarizing the results of the sampling event or field activity.

2.0 Health and safety considerations

2.1 The health and safety (H&S) considerations for the work associated with this SOP, including physical, chemical, and biological hazards are addressed in the site-specific Health and Safety Plan (HASP) and associated addendums (MPI 2005a; MPI 2005b; AECOM 2011). The major H&S considerations for the work associated with water sample collection are the marine safety aspects of the program.

2.2 Daily safety briefs will be conducted at the start of each working day before any work commences. These daily briefs will be facilitated by the Site Safety Officer (SSO) or his/her designee to discuss the day's events and any potential health risk areas covering every aspect of the work to be completed. Weather conditions are often part of these discussions. As detailed in the HASP, everyone on the field team has the authority to stop work if an unsafe condition is perceived until the conditions are fully remedied to the satisfaction of the SSO.

3.0 Interferences

3.1 Contamination during sampling activities can affect the accurate determination of total and dissolved metals at trace levels. Potential sources of contamination include metallic sampling equipment, deionized water, and dust from automobile/boat exhaust, cigarette smoke, nearby roads, and bridges (USEPA 1996). Adherence to the CH/DH procedures as described in Section 5.0 will minimize these interferences.

3.2 Cross-contamination of samples may result if sample handling equipment is inadequately or improperly decontaminated. Refer to SOP LPR-G-03 for decontamination procedures.

3.3 Care must be taken to avoid disturbing the bed sediment during sampling. Re-suspended bed sediments may contaminate the surface water samples.

3.4 High sample turbidity may cause clogging of the filter membrane and cause a decrease in filter efficiency/rate. Monitoring of flow rate is recommended; if a significant decrease is noted, replacement of the filter may be needed.

3.5 Purging the pump system with a minimum of three volumes of site water will ensure that the sample collected is representative of the sample location and desired depth.

4.0 Equipment and materials

The following equipment list contains materials which may be needed in carrying out the procedures contained in this SOP. Not all equipment listed below may be necessary for a specific activity. Additional equipment may be required, pending field conditions.

- Water pump (peristaltic pump capable of 10 liters/minute (L/min) or better)
- 12-volt battery (as needed)
- Electrical connectors
- Laboratory-supplied pre-cleaned and double-bagged CFLEX™ or equivalent polymer tubing (typical configuration requires 3/8 inch ID), a 50-foot length will be required for the deepest portion of the Lower Passaic River (LPR). Greater than 50 feet of tubing may be required for deep samples. If tubing must be connected to create longer lengths, inert and decontaminated connectors will be used.
- Pre-cleaned and double-bagged Voss Technologies 0.45 micron inline metals filter (or equivalent)
- Teflon Y-connectors
- Stainless steel tubing clamps
- Laboratory-supplied double-bagged water sample containers per QAPP Worksheet #19
- Weight bearing line/cable and anchor weight
- Field laptop computer, equipped with Intelligent Data Entry Form® (IDEF) software or equivalent (optional)

- Approved plans, including target sampling locations
- Insulated coolers with wet ice
- Field notebook, pen, standardized forms (as needed)
- Chain-of-custody forms and seals
- Chemical-free wipes
- Plastic tape
- Zipper-lock bags
- Laboratory supplied reagent water
- Tap water supply
- Pre-cleaned pipets
- Survey vessel fitted with differential global positioning system (DGPS) navigational equipment (SOP LPR-G-02) and a fathometer
- Safety gear (first aid kit, work vests, HASP specified personal protective equipment [PPE])

5.0 Procedures

5.1 Instrument Set-Up

Fasten the CFLEX™ tubing to the datasonde that will be used to conduct water column profiling (SOP No.: LPR-FI-05) with small cable ties. Avoid causing any obstruction to the turbidity sensor. Attach the datasonde and the tubing inlet to the weighted deployment line at approximately 3 feet (ft) above the anchor weight. The tubing and the sensor cable should then be fastened (with cable ties or similar) to the weighted deployment line at regular intervals over the entire length.

5.2 Water Pump

Connect the pump to a 12-volt battery or directly to the vessel's 12-volt electrical system using appropriate electrical connections. The water pumps, associated tubing, and filters should be new and dedicated to the project. Tubing and filters are received pre-cleaned from the laboratory and will be kept in sealed zip-top plastic bags prior to use. New tubing and filters will be used for each sample. Water pumps should be rinsed with tap water before and after each sampling day in accordance with SOP LPR-G-03. Rinsing is not generally required for the sampling apparatus (pump, datasonde etc.) between stations (or between sampling depths). However, the internal volume of water carried in the system (pump inlet to pump outlet) should be purged with a least three volumes of river water to ensure that a representative sample is collected. Prior to sampling, the tubing shall be rinsed with site water.

5.3 Equipment Rinsate Blanks

Equipment rinsate blanks will be collected at the frequency specified in the QAPP, and from each

set of sampling gear (tubing and tubing outfitted with a filter) after the sampling gear is decontaminated. Rinsate blanks will be collected by pumping laboratory-supplied reagent water through a pre-cleaned (by the laboratory) length of tubing (and filter for dissolved samples) to fill the appropriate sample containers. Laboratory-specific reagent water will be used to prepare the rinsate blank for each laboratory performing rinsate blank analysis.

5.4 Sample Bottles

The laboratory will supply pre-cleaned Fluorinated Ethylene Propylene (FEP), Polytetrafluoroethylene (PTFE), conventional or linear polyethylene, polycarbonate, or polypropylene sample containers with lids in double zip top plastic bags. Bottles for low-level mercury (Hg) analysis should be fluoropolymer or glass. The containers will be rinsed with a 0.1% Hydrogen Chloride (HCl) (v/v) solution and then filled with reagent water by the laboratory prior to shipment to the field facility.

5.5 Deployment/Field Data Collection

5.5.1 Navigate to the station of interest using the navigational procedures outlined in SOP LPR-G-02 – Navigational Positioning.

5.5.2 Deploy the datasonde and attached sampling tube and begin water column profiling and sampling as outlined in the QAPP and SOPs LPR-FI-04 and LPR-FI-05. Ideally, boat engines and/or generators should be shut off during sampling. If this is not possible, then the sampling platform should be positioned upwind from any running combustion engines.

Prior to filling any bottles for metals analysis one member of the field team will be designated as the DH sampler and one member of the team will be designated as the CH sampler. The DH sampler will handle the outer sample bags and operate the pump and all other equipment during the sampling process. The CH sampler will don new nitrile gloves and only contact the inner sample bags, sample containers, filters, and sample tubing until sampling is complete.

Once the pump has been purged according to SOP LPR-FI-04 and the sample is ready to be collected, the DH sampler will open the outer bag of the appropriate sample container and allow the CH sampler to remove the inner bag and bottle. The CH sampler should take care not to contact the outer surface of the outer bag. The CH will then open the inner bag, remove the bottle, and uncap the bottle for sample collection directly from the sample tubing (the CH sampler should take care to minimize the amount of time the bottle is open to reduce the potential for atmospheric contamination). Once the required volume is collected the process is reversed to return the bottle to the inner and outer bags.

Bottles may be received pre-preserved from the laboratory using the preservatives appropriate for each analysis, as presented in Worksheet #19 of the QAPP. If bottles are not pre-preserved, preservative will be added to the sample bottles once filled with site water, and the bottle will be inverted to ensure mixing. The preservatives for each metal are as follows:

- Methylmercury: sulfuric acid
- Hexavalent chromium: laboratory-provided buffer solution
- Mercury: bromine chloride
- Other TAL metals and titanium: nitric acid

If the program requires the collection of field-filtered dissolved metals, water for these parameters will be collected concurrent with the total metals. Tubing coming off the pump will be fitted with a laboratory-decontaminated Y-connector, of inert material. Lengths of Teflon-lined poly tubing will be attached to each end of the Y-connector, one length of tubing will be fitted with a Voss capsule (Catalog number: GWC-45-EA-R), or equivalent, laboratory-cleaned 0.45 micron filter by the CH sampler. Clamps will be used on the tubing to cut off flow to either end such that water may flow for total metals or through the filter for dissolved metals. The clamp for the dissolved metals tubing will be located upflow of the filter to prevent pressure on the filter while the total metals sample bottles are being filled. The preserved bottles for total mercury and dissolved mercury will be filled, alternating approximately 25% of volume, until full. The DH sampler will operate the pump and clamps. This will continue for other parameters that require the collection of total and dissolved samples, such as methylmercury and TAL metals. Should the inline filter clog, a new 0.45 filter will be placed on the tubing, and that filter purged for 10 seconds prior to resuming sampling.

High sample turbidity may cause clogging of the filter membrane and a decrease in filter efficiency/rate. If the rate of flow is observed to decrease substantially, then it is recommended that the filter be replaced by the CH sampler by first removing the tubing outlet from the sample container. The DH sampler should then turn off the pump, reverse the pump direction, turn the pump back on to release pressure in the filter, turn the pump off again, and finally remove the used filer. A new filter can then be installed and purged as described above.

All samples will be collected into bottles that were received pre- preserved (QAPP Worksheet #19) or will be preserved upon receipt at the laboratory.

5.5.3 Sample collection information will be recorded at the time of collection using either IDEFs, standardized forms, the field logbook, or a combination. This information will include, but not be limited to, the station ID, sample ID, time and date of sample collection, sample collection depth, the sampler's name, vessel, description of any sample processing, and any pertinent observations. An example of the IDEF is provided as Attachment 1. Refer to QAPP Worksheet #27 for sample identification details.

5.5.4 Samples will be placed in coolers and stored on ice (refer to QAPP Worksheet #19 for containerization and storage specifications) until shipment to the laboratory.

5.5.5 Sample custody, packaging and shipment will be conducted according to the procedures described in SOPs LPR-G-05 – Sample Custody, and LPR-G-06 – Packaging and Shipping.

6.0 Quality assurance / quality control

6.1 Entries on the forms and in the field logbook will be checked by the samplers to verify that the information is correct.

6.2 It is the responsibility of the Field Task Manager (FTM) or designee to spot check adherence to the procedural requirements of this SOP, and to review the associated documentation for accuracy and completeness.

6.3 Data quality evaluations will be based on quality control (QC) sample results. QC samples may include field duplicates, matrix spike/matrix spike duplicate (MS/MSD) samples, and equipment rinsate blanks; frequency of collection requirements is tabulated in QAPP Worksheet #28. Additional volume for field duplicates and MS/MSD samples will be collected according to the methods outlined in this SOP; however, bottles will be filled concurrently (rather than sequentially) if possible to minimize variability between sample containers.

7.0 Data and records management

7.1 Field records will be generated and maintained as outlined in SOP LPR-G-01 – Field Records and in the LPR Data Management Plan (DMP) [AECOM 2010]. These documents cover all aspects of collection including chronology of events, station locations, time/date, sampler name, and data collected.

7.2 Field data will be maintained and distributed to the appropriate personnel as described in the LPR DMP (AECOM 2010).

7.3 Deviations to the procedures detailed in the SOP must be recorded in the field logbook at the time of occurrence and summarized on the Daily Activity Log (refer to SOP LRP-G-01 – Field Records). A formal nonconformance report (NCR) will be completed (refer to SOP LRP-G-01 – Field Records) and distributed as specified in the QAPP.

7.4 All records associated with the activities described in this SOP will be ultimately maintained in accordance with the Lower Passaic River Quality Management Plan (AECOM 2009).

8.0 Personnel qualifications and training

The individuals executing these procedures must have read, and be familiar with, the requirements of this SOP and the corresponding LPRRP plans (e.g., HASP, QAPP, DMP, and FSP). Inexperienced personnel performing these activities will be initially be supervised by the FTM or designee.

9.0 References

AECOM 2009. Quality Management Plan, Lower Passaic River Restoration Project, CERCLA Docket No. 02-207-2009. September 2009 or current version.

AECOM 2010. Lower Passaic River Data Management Plan. July 2010 or current version.

AECOM 2011. Lower Passaic River Restoration Project, Remedial Investigation, Health and Safety Plan Addendum. June 2011 or current version.MPI 2005b. Lower Passaic River Restoration Project Health and Safety Plan Final Addendum – Sediment Coring. July 2005.

USEPA 1996. Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality

Criteria Levels. July 1996.

10.0 Revision history

Revision	Date	Changes
0	June 2010	NA
1	September 2010	Addition of sample filtering procedure, attachment of IDEF example, minor revisions throughout document
2	July 2011	Addition of collection of dissolved metals samples using water collected into unpreserved bottles prior to filtering; minor revisions throughout document.
3	August 2011	Modification to dissolved metals sample collection.

Attachment 1. Example of IDEF